

Black Eagle Hydroelectric Facility
Great Falls Hydroelectric Facilities
Great Falls Vicinity
Cascade County
Montana

HAER No. MT-97

HAER
MONT
7-GREFA.
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WRITTEN DESCRIPTIVE AND
HISTORICAL DATA

HISTORIC AMERICAN ENGINEERING RECORD
Rocky Mountain Regional Office
National Park Service
P.O. Box 25287
Denver, Colorado 80225-0287

HISTORIC AMERICAN ENGINEERING RECORD

BLACK EAGLE HYDROELECTRIC FACILITY

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I. INTRODUCTION

Location: The Black Eagle Hydroelectric Facility is on the Missouri River at Great Falls, Montana. It is one of five hydroelectric generating plants situated along a 15-mile stretch of the river. The Black Eagle Hydroelectric Facility lies within the boundaries of the Great Falls Hydroelectric Facilities Historic District.

Quad: Northwest Great Falls, Mont.

UTM: Zone 12: 480830 Easting, 5263060 Northing
Zone 12: 480250 Easting, 5262590 Northing
Zone 12: 480200 Easting, 5262860 Northing
Zone 12: 480400 Easting, 5262960 Northing

Date of Construction: 1926-27

Present Owner: The Montana Power Company

Present Use: Hydroelectric Generating Plant

Significance: The Great Falls Hydroelectric Facilities Historic District is significant for its association with the industrial development of Montana and the consolidation of most of the state's electric industry into The Montana Power Company. The district is also associated with John D. Ryan, a promoter of hydroelectric development at Great Falls. In addition, it has buildings, structures, and equipment that are representative of design concepts of the early twentieth century. The Black Eagle Hydroelectric Facility is a contributing complex to the district.

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September 1996

II. HISTORY OF THE BLACK EAGLE HYDROELECTRIC FACILITY

A. INTRODUCTION

The Black Eagle Hydroelectric Facility is on the Missouri River at the city of Great Falls, Cascade County, Montana. It is one of five hydroelectric developments situated along the Great Falls region of the Missouri, a 15-mile stretch of river marked by a series of five falls and several intervening rapids. The Black Eagle Facility is at Black Eagle Falls, the western-most of the Great Falls (figure 1). The other Great Falls hydroelectric power developments lie downstream (east) from Black Eagle and include the Rainbow, Cochrane, Ryan and Morony facilities. Although Black Eagle was the site of Montana's first hydroelectric power development in the early 1890s, the primary components at the facility date from its 1926-27 redevelopment.

The Black Eagle Hydroelectric Facility is in the boundaries of the Great Falls Hydroelectric Facilities Historic District. Resources at Black Eagle that contribute to the district are the 1926-27 dam, headrace, and powerhouse, as well as a few other structures auxiliary to power production (figure 2). The ruins of power plant facilities from the 1890s and a 1913 redevelopment project remain on-site, but lack sufficient integrity to contribute to the historic district.

B. EARLY HYDRO DEVELOPMENTS AT BLACK EAGLE FALLS: THE 1890s HYDRO POWER FACILITIES AND THE 1913 REDEVELOPMENT PROJECT

Initial development of the vast power potential of the Great Falls of the Missouri came about at Black Eagle Falls in the late-nineteenth century. In 1887, a group of Montana businessmen with financial backing of Minnesota rail magnate, James J. Hill, incorporated the Great Falls Water Power and Townsite Company (Power and Townsite Company) for the dual purpose of developing the Great Falls' hydro power sites and the townsite of Great Falls.¹ By late-1889, the Power and Townsite Company had signed an agreement with its first hydro power customer, the Boston and Montana Consolidated Copper and Silver Mining Company of Butte (Boston and Montana), one of the leading copper producers in the state. Boston and Montana intended to relocate its reduction facilities from Butte to Great Falls, in part to take advantage of the industrial power source offered by Black Eagle Falls.²

The power agreement formulated between the Power and Townsite Company and Boston and Montana outlined specific stipulations to be performed by each party. The Boston and Montana agreed to develop a reduction facility on the north side of the Missouri River at Black Eagle Falls. Work on the project was to start within 30 days and be completed at a cost of not less than \$300,000. In return, the Power and Townsite Company consented to build "...a durable

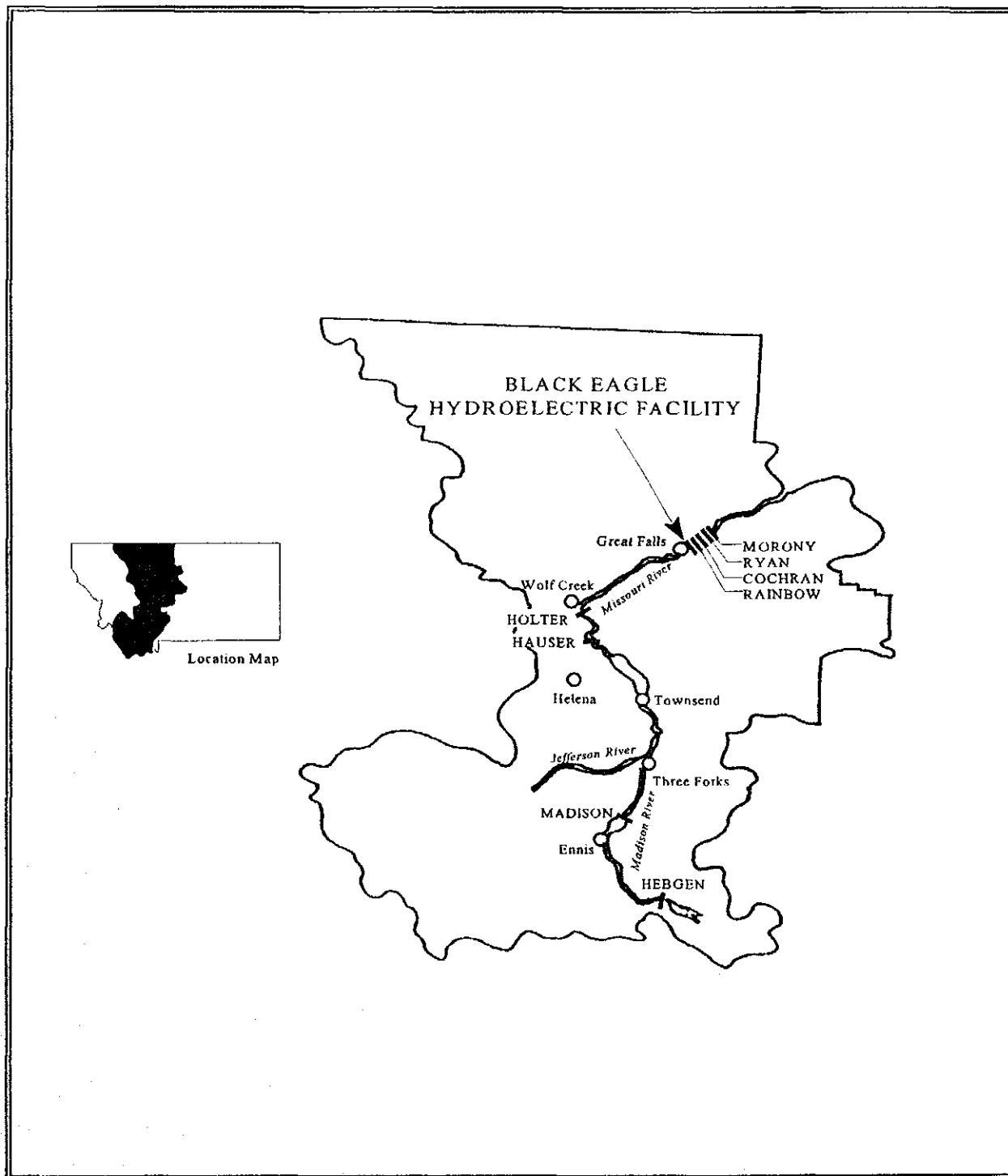


Figure 1. Black Eagle Hydroelectric Facility
Area Map

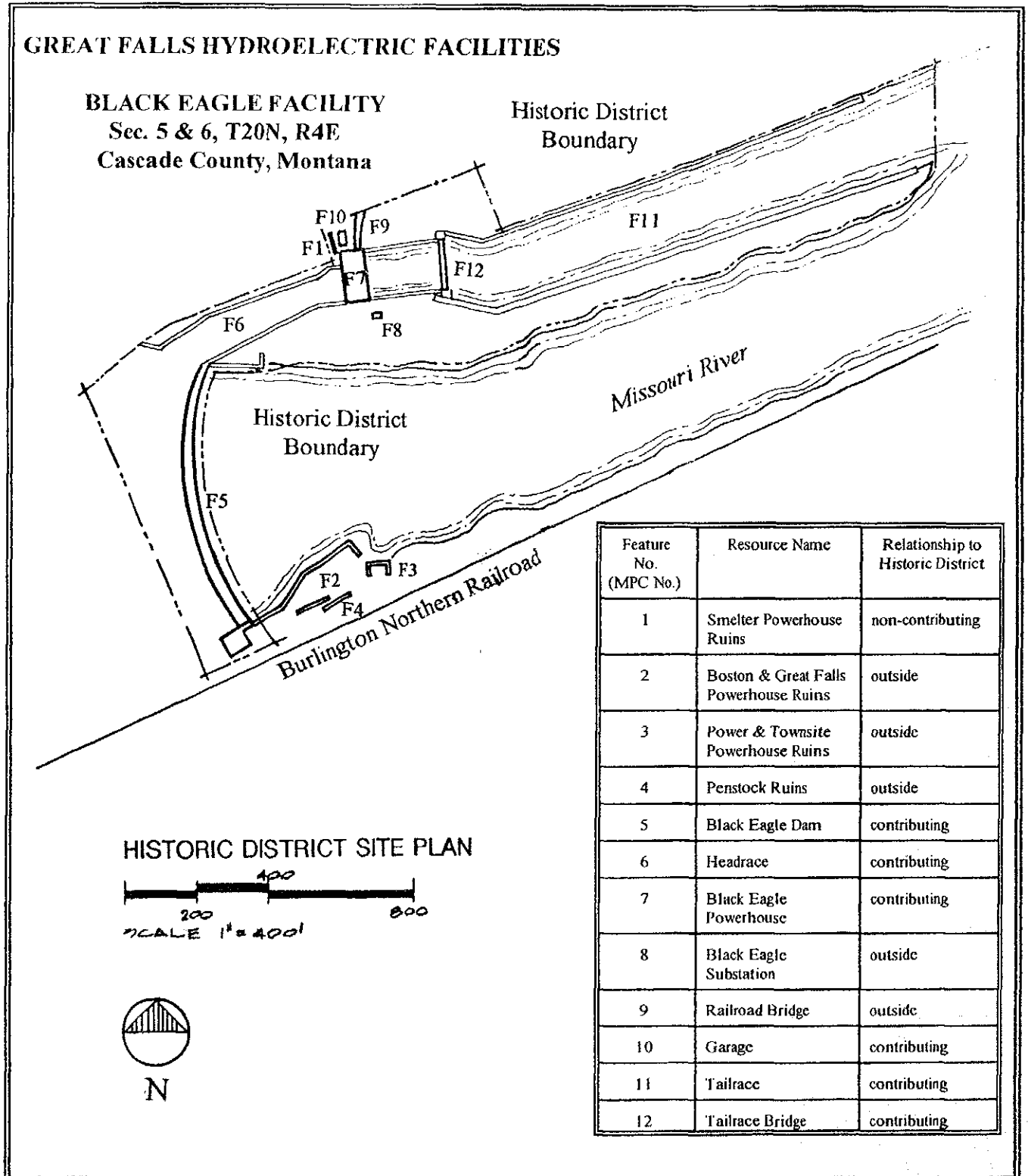


Figure 2. Black Eagle Hydroelectric Facility
Site Map

dam at once...with forebays to the dam on both sides of the river..." and to make available 5,000 horsepower of hydro power a year, starting on January 1, 1891. Power was to be delivered from the north forebay to the penstocks and powerhouse "...to be built and maintained at the expense of the Smelting Company."³

The Great Falls Water Power and Townsite Company began construction of the Black Eagle Dam in the spring of 1890. When completed in March 1891, the dam was a low, timber-crib structure. Gates at the north end of the dam opened into a long, rectangular headrace formed by stone walls, while the south gates opened into a small forebay closed at its downstream end by a masonry wall.⁴

The Boston and Montana meanwhile constructed a powerhouse at the dam's north end, adjacent to the headrace. It went on-line in February 1892, equipped with seven horizontal turbines having a combined capacity of 2,600 horsepower. Most of this power was transmitted in mechanical form some 2000 feet to Company's new smelter and concentrator by long manilla ropes strung along cast-iron idler wheels. Generators furnished some electricity for lighting and the electrolytic refinery.⁵

Several other power facilities were developed at Black Eagle Dam before the turn of the century. In 1891, the Power and Townsite Company constructed a hydroelectric plant just below the south end of the dam for the Boston and Great Falls Electric Light and Power Company.⁶ In 1893-1894, the Power and Townsite Company constructed its own powerhouse on the south riverbank, slightly downstream from the Boston and Great Falls powerhouse. The facility furnished mechanical power to Royal Milling Company's flour mill located atop the bluff on the south riverbank.⁷ And in 1897, the Boston and Montana company built an additional powerhouse at the east end of Black Eagle dam's north headrace. Equipped with turbines direct connected to 180 volt generators, the plant supplied electricity to the company's newly-established electrolytic zinc plant.⁸

Despite the success of the early Black Eagle plants, other potential power sites at the Great Falls remained untapped for many years. Hydroelectric developers in Montana instead constructed generating plants at sites closer to the mining and reduction industries in Butte and Anaconda, the state's primary electrical consumers. Other early hydroelectric facilities in Montana included the Big Hole plant (1898) on the Big Hole River, the Madison plant (1902) on the Madison River, and the Canyon Ferry (1898/1902) and Hauser (1907) plants on the Missouri River near Helena (see figure 1).

The failure of Hauser Dam in April 1908 stimulated more extensive hydroelectric development at the Great Falls. Soon after that disaster, John D. Ryan, president of Anaconda Copper Mining Company (ACM), Montana's largest mining company, and his associates acquired the GFWP&TC and its hydropower assets. These included both developed (Black

Eagle) and undeveloped sites at the Great Falls. By August, GFWP&TC had begun plans to construct a 25,000-kilowatt plant at Rainbow Falls. This plant was intended to ensure an ample and reliable supply of power for the Butte and Anaconda mining industries.⁹

Soon after completion of the Rainbow Development, Ryan and his associates moved to consolidate the major electric power producers in the state. In 1910, they dissolved the GFWP&TC and transferred the Black Eagle and Rainbow Developments and the undeveloped Great Falls hydro sites to a new company, the Great Falls Power Company (GFPC). Two years later, Ryan and others formed The Montana Power Company and absorbed most of Montana's major electric utility companies. By mid-February 1913, Montana Power had also acquired majority interest in the GFPC (GFPC functioned as a subsidiary of Montana Power until 1929, when it was dissolved and all assets absorbed by Montana Power). As a result, Montana Power gained control of almost all of the electric power facilities in the state, with the bulk of the power supply provided by hydroelectric generating plants on the Madison and Missouri rivers.¹⁰

In 1913, the Company upgraded the generating capacity at Black Eagle from 1,000 to 3,000 kilowatts by redevelopment of the facilities on the south side. They abandoned the Boston and Great Falls powerhouse and converted the Great Falls Water Power and Townsite Company powerhouse into an electric plant. All existing equipment was removed from the powerhouse; two 1,500 kilowatt generators were installed; a double surge chamber was erected along the south exterior wall of the powerhouse with a turbine installed in each chamber unit; and two original penstocks from the dam rerouted to the surge chamber. Besides the city of Great Falls, the new power plant supplied electric power to the immense reduction works at Black Eagle, which had been acquired by ACM. In addition, the Royal Milling Company's flour mill was adapted for electrical power.¹¹

C. BLACK EAGLE REDEVELOPMENT, 1926-27

In April 1926, the Great Falls Power Company began a second redevelopment of the Black Eagle facility to substantially upgrade its generating capacity. The upgrade was needed, in part, because the 3,000 kilowatt plant developed in 1913 could no longer meet the power needs of the city of Great Falls. At the same time, ACM was in the process of doubling the operating capacity of its electrolytic zinc plant at Black Eagle and anticipated the need for an additional 10,000 kilowatts of power.¹²

Charles T. Main Company supervised the design and construction of the redevelopment project. Because of the excessive costs for rehabilitating the existing Black Eagle dam and inherent inefficiencies in the multiple powerhouses associated with original development, only the south abutments and the headrace would be incorporated into the new facility and even these would be extensively rehabilitated. The new powerhouse was to be a modern, concrete building located at the downstream end of the headrace at the site of the 1897 electrolytic powerhouse.¹³

Work commenced with removal of the old electrolytic powerhouse. In September 1926, laborers began pouring concrete for the new gravity dam, while the original timber crib dam, located about 50 feet upstream, served as a cofferdam. On August 1, 1927, the new facility was completed, and was placed in regular operation in September 1927. It went on-line with a total capacity of 18,000 kilowatts, stepped down through six 6,600/2,200 volt transformers and distributed locally in Great Falls and the ACM zinc plant.¹⁴

The hydroelectric generating equipment used at the 1926-27 Black Eagle Facility represented state of the art technologies. It included three turbine-generator units in a vertical configuration and other components ancillary to power production. One of the nation's leading turbine manufactures of the period, the S. Morgan Smith Company of York, Pennsylvania supplied the plant's hydraulic equipment, including the turbines, governance system, and draft tubes. The turbines were propeller-type reaction runners, rated at 9,300 horsepower each. The runners, complete with scroll cases and wicket-type gates, were each installed in separate pits, integral with the powerhouse's concrete substructure and accessed at the basement level. The vertical drive-shaft of a unit extended up to the generating floor where it was direct-connect to a Allis-Chambers generator rated at 7,000 kVA. An oil-pressure governance system regulated turbine-generator speed, while DC generators direct-connect to the drive shafts provided the excitation field for the generators.

III. ENDNOTES

1. Paris Gibson, *The Founding of Great Falls and Some of Its Early Records* (Great Falls: Tribune Printers and Binders, 1914).
2. "Great Falls Water Power and Townsite Company," n.d., p. 1-2, manuscript at Record Services, The Montana Power Company, Butte, Montana; Cecil H. Kirk, "History of Montana Power," n.d, volume I: chapter: 4: page 103, 3 volume manuscript at The Montana Power Company, Butte, Montana, .
3. "Great Falls Water Power and Townsite Company," 2-3.
4. Maurice S. Parker, "Black Eagle Falls Dam, Great Falls, Montana, *Transactions of the American Society of Civil Engineers* (July 1892): 58-64.
5. "Great Falls Water Power and Townsite Company," 3; Kirk, "History of Montana Power," I:4:107
6. Kirk, "A History of Montana Power," I:4:106-107.
7. "Great Falls Water Power and Townsite Company," p. 5; "Black Eagle Development," n.d., p. 5, manuscript at the Rainbow Shop, The Montana Power Company, Great Falls Montana.
8. "Great Falls Water Power and Townsite Company," p. 6; *Sanborn Fire Insurance Map of Great Falls*, 1900.
9. "Great Falls Water Power and Townsite Company," p. 7-8; Carrie Johnson, "Electrical Power, Copper, and John D. Ryan," *Montana: The Magazine of Western History* 38 (Autumn 1988): 28-33.
10. Johnson, "Electrical Power, Copper, and John D. Ryan," 28-33.
11. "Great Falls Power: Construction of Black Eagle Plant," 10 February 1913, pp. 1-3; "History of Black Eagle Dam," n.d., p. 1, manuscripts at the Rainbow Shop, The Montana Power Company, Great Falls.
12. Frank Bird, *Story of Montana Power* (Butte: The Montana Power Company, 1941), 50; Kirk, "A History of Montana Power." I:5:27 and II:9:34.
13. R.A. Moncrieff, "Hydro-Electric Redvelopment on the Missouri River," *Engineering News-Record* 101 (July 1928): 49-50.
14. Ibid.; Kirk, "History of Montana Power," II:9:35.

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Sanborn Fire Insurance Map of Great Falls. 1900.